Absence of musculocutaneous nerve associated with a third head of biceps brachii muscle and entrapment of ulnar nerve

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ABSTRACT

Variations in the formation of the brachial plexus and in the course of its branches are not as uncommon as was once thought. A description of the abnormalities and complexities of the anatomy of the upper arm is very important with regard to surgical approaches. This case study reports a combined absence of musculocutaneous nerve associated with a third head of biceps brachii muscle in the left upper arm of an adult male cadaver. Moreover, the left ulnar nerve is entrapped within the substance of the medial head of the triceps muscle. The clinical implications, as well as the possible clinical symptoms resulting from these anomalies are discussed.


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The brachial plexus is described as being formed of the ventral rami of the lower 4 cervical and first thoracic spinal nerves, with a variable contribution from C4 and T2. All the nerves of the brachial plexus are formed and remain in 2 planes, anterior and posterior. The anterior plane comprises the branches of the lateral and medial cords of the brachial plexus, while the posterior plane comprises the branches of the posterior cord. Variations and connections are frequently present among these nerves. The musculocutaneous nerve (C5, C6, and C7) arises from the lateral cord of the brachial plexus in the axilla, and innervates coracobrachialis, biceps brachii, and brachialis muscles. It terminates as the lateral cutaneous nerve of the forearm. Morphological variations of the brachial plexus are relatively frequent. Variations in the course and branches of the musculocutaneous nerve have been reported. The biceps brachii muscle is classically described as originating from 2 heads; a long head from the supraglenoid tubercle of the scapula, and a short head from the tip of the coracoid process of the scapula, in common with the coracobrachialis muscle. The 2 heads unite into a common tendon, which is inserted into the radial tuberosity and sends an aponeurotic extension to the deep fascia of the forearm. A third head of biceps brachii has been reported unilaterally as well as bilaterally. The ulnar nerve (C7, C8, and T1) arises from the medial cord of the brachial plexus. It initially courses in the anterior compartment of the upper arm. It then passes distally through the medial intermuscular septum to enter the posterior compartment of the upper arm, and finally leaves to the forearm by passing behind the medial epicondyle of the humerus. Variations of the course of the ulnar nerve in the upper arm are not as common as anatomic variations of its branches in the forearm and hand. The present study reported a case of absence of the musculocutaneous nerve associated with a third head of biceps brachii muscle and ulnar nerve entrapment in the substance of the medial head of the triceps muscle.

Case Report. During dissection of the left upper limb of an adult male Caucasian cadaver aged 60-65 years, in the Department of Anatomy, College of Medicine, King Saud University, Riyadh, Kingdom of Saudi Arabia, the musculocutaneous nerve was absent. A careful dissection of the brachial plexus showed that the lateral cord, after giving the lateral pectoral nerve that supplied pectoralis major muscle and a muscular branch to coracobrachialis muscle, communicated twice with the medial root of the median nerve, a branch from the medial cord of the brachial plexus. The proximal communicating branch was short, thick, and horizontal. The distal communicating branch was longer, thinner, and oblique. The lateral cord then bifurcated into 2 branches. The first branch was a common stem that supplied a third head for the biceps brachii muscle, and continued as the lateral
cutaneous nerve of the forearm (Figure 1). The third head of the biceps brachii muscle was medial to the other 2 heads. It originated from tendinous fibers, mainly from the middle of the anteromedial surface of the humerus, and partially from the tendinous origin of the medial head of triceps muscle. The third head joined the tendon of biceps (Figure 1). The present study reported also an abnormal course of the ulnar nerve in the arm. After piercing the medial intermuscular septum, the ulnar nerve became deeply situated within the substance of the medial head of triceps muscle until it projected behind the medial epicondyle of the humerus (Figure 1).

**Discussion.** The present study reported a case of a combined anomaly of a unilateral absence of musculocutaneous nerve together with the unilateral presence of a third head of biceps brachii muscle. The lateral cord of brachial plexus directly supplied coracobrachialis, and short and long heads of biceps brachii, together with brachialis. However, the lateral cutaneous nerve of the forearm, and a muscular branch for the third head of biceps brachii arose from the median nerve in the upper arm. Le Minor and Nakatani et al reported cases of unilateral absence of the musculocutaneous nerve in which the muscles of the anterior compartment of the upper arm and the skin on the lateral side of forearm are totally supplied by direct branches from the lateral cord. However, Prasada Rao and Chaudhary reported 2 cases in which the median nerve took over the area of supply of the musculocutaneous nerve by giving both the muscular and sensory branches. Similarly, Ihunwo et al reported a case of bilateral absence of the musculocutaneous nerve with 4 branches arising from the median nerve; 3 muscular branches, one for each of the muscles of the anterior compartment of the upper arm, and the last continued as the lateral cutaneous nerve of the forearm. In the present study, 2 communications existed between the lateral cord and the medial root of the median nerve. It is possible that, through these communications, the lateral cord sends contributions to the median nerve for the third head of biceps brachii muscle, and for the skin of the lateral side of the forearm.

In their study, Prasada Rao and Chaudhary reported a percentage of 8% for absence of musculocutaneous nerve. It seems that the percentage of 8% is misleading. The study of the previous authors was performed on 24 upper limbs of 12 bodies. We think that such number is not sufficient to assess the real percentage of the occurrence of this anomaly, which may be influenced by racial or genetic factors. In their reports on anatomic variations of the upper extremity, Tountas and Bergman mentioned that the musculocutaneous nerve arose from the median nerve in 2% of cases studied. However, it seems to be more appropriate to use the word “variations” than the word “anomalies” when speaking of the different patterns of branches of the brachial plexus. Knowledge of possible expected variations of the branches of the brachial plexus is of great importance not only for the anatomists but also for the clinicians and surgeons. In this particular case, injury to the median nerve in the upper arm would, in addition to the usual effects, result in loss of sensation on the lateral surface of the forearm.

The present study reported the presence of a unilateral third head of biceps brachii muscle that originated from the middle of the anteromedial surface of the humerus and, partially, from the tendinous origin of the medial head of the triceps muscle. Similar observations were reported bilaterally and unilaterally. However, Ozan et al described an origin from the tendon of insertion of the deltoid muscle. The presence of a third head of biceps brachii has its functional and clinical implications. From a functional viewpoint, the humeral origin of the third head of biceps would allow consistent flexion of the elbow joint irrespective of the position of the shoulder joint. The clinical significance of the third head of biceps is its association with unusual bone displacement subsequent to fracture.

In the present case, the ulnar nerve was observed to run a part of its course in the upper arm within the substance of the medial head of the triceps muscle. Kang et al reported a case of entrapment of a branch of the
ulnar nerve within the flexor carpi ulnaris muscle in the forearm. Numerous cases of ulnar nerve compression at the level of the wrist joint have been reported. These include ganglion, occupational trauma, fracture, hypertrophy of the flexor carpi ulnaris, carpal osteoarthritis, and rheumatoid arthritis. However, anatomic variations of the course of the ulnar nerve, particularly in the upper arm, are rarely implicated as a cause of motor and sensory neuropathy. In the present case, sustained contraction of the triceps muscle in prolonged extension of the elbow joint (for example, during lifting heavy weight) would possibly evoke symptoms of compression of the ulnar nerve, which might result in numbness in the hand.

In summary, the present study reported a case of absence of the musculocutaneous nerve associated with a third head of the biceps brachii muscle, and entrapment of the ulnar nerve.

References


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